

## AGENDA

**19:00 - 19:30**

Check-in, drinks & snacks

**19:30- 20:15**

Presentation Workshop

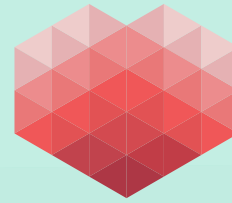
**20:15 - 21:00**

Discuss, drinks & snacks



Please edit this Agenda for your workshop timings

THE WORLD'S LARGEST 3D PRINTER NETWORK



3D HUBS

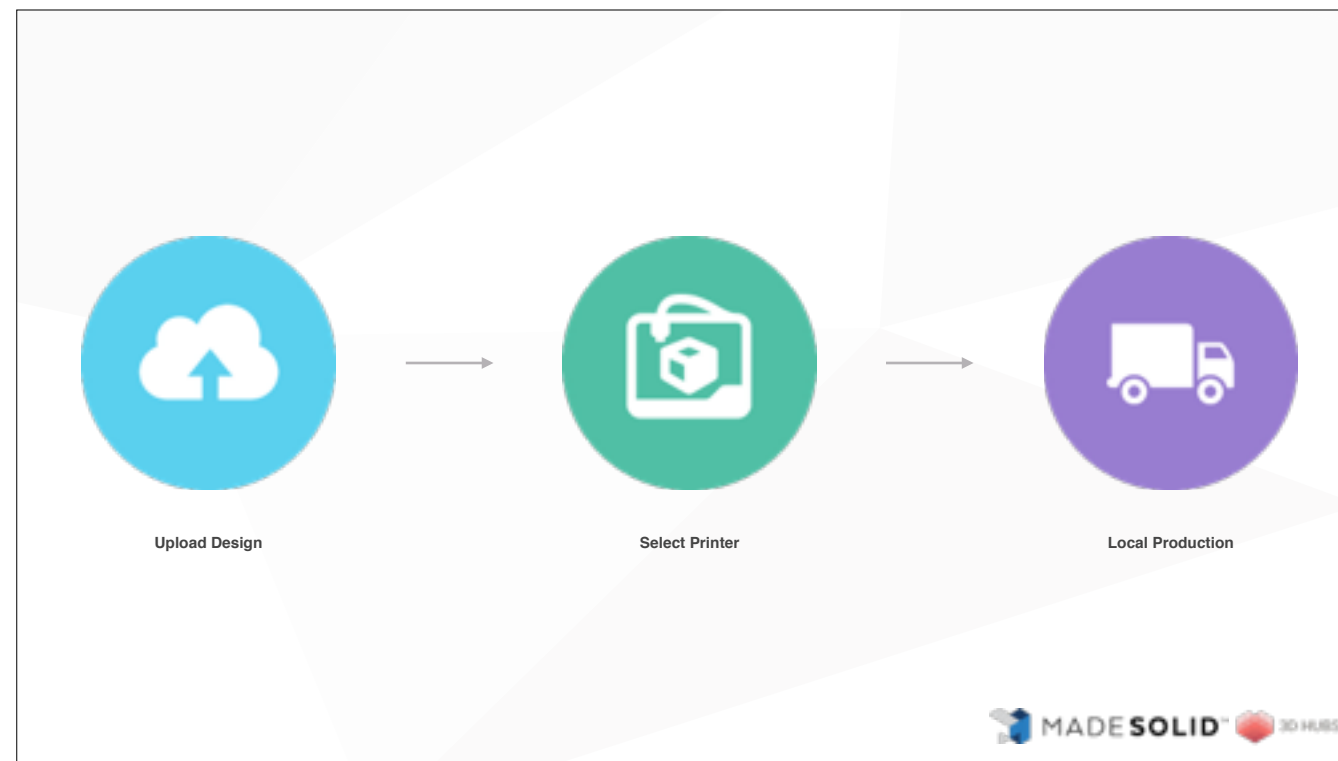
"3D Hubs tapped into a  
market that needed tapping"

**Forbes**

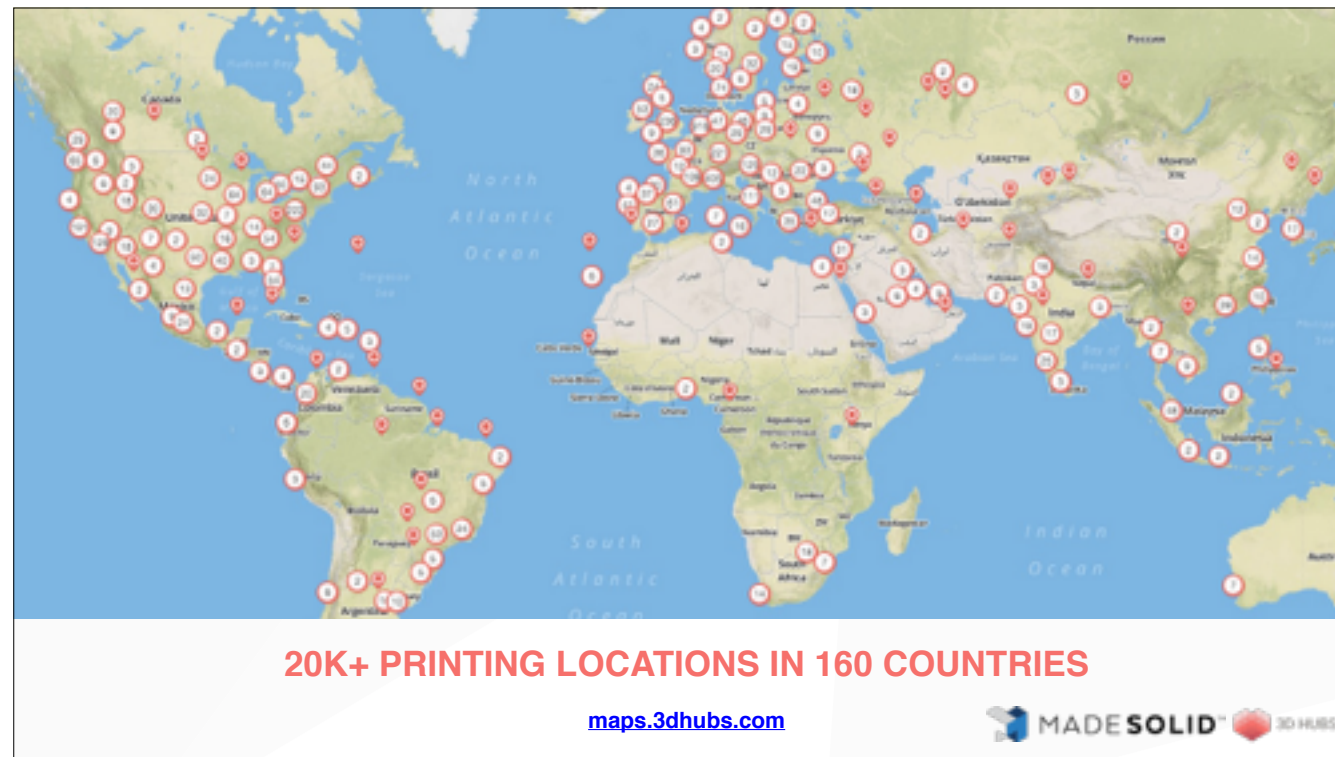
"3D printing on demand is  
now locally available"

**ESTIMOTE**

[www.3dhubs.com](http://www.3dhubs.com)  
@3dhubs

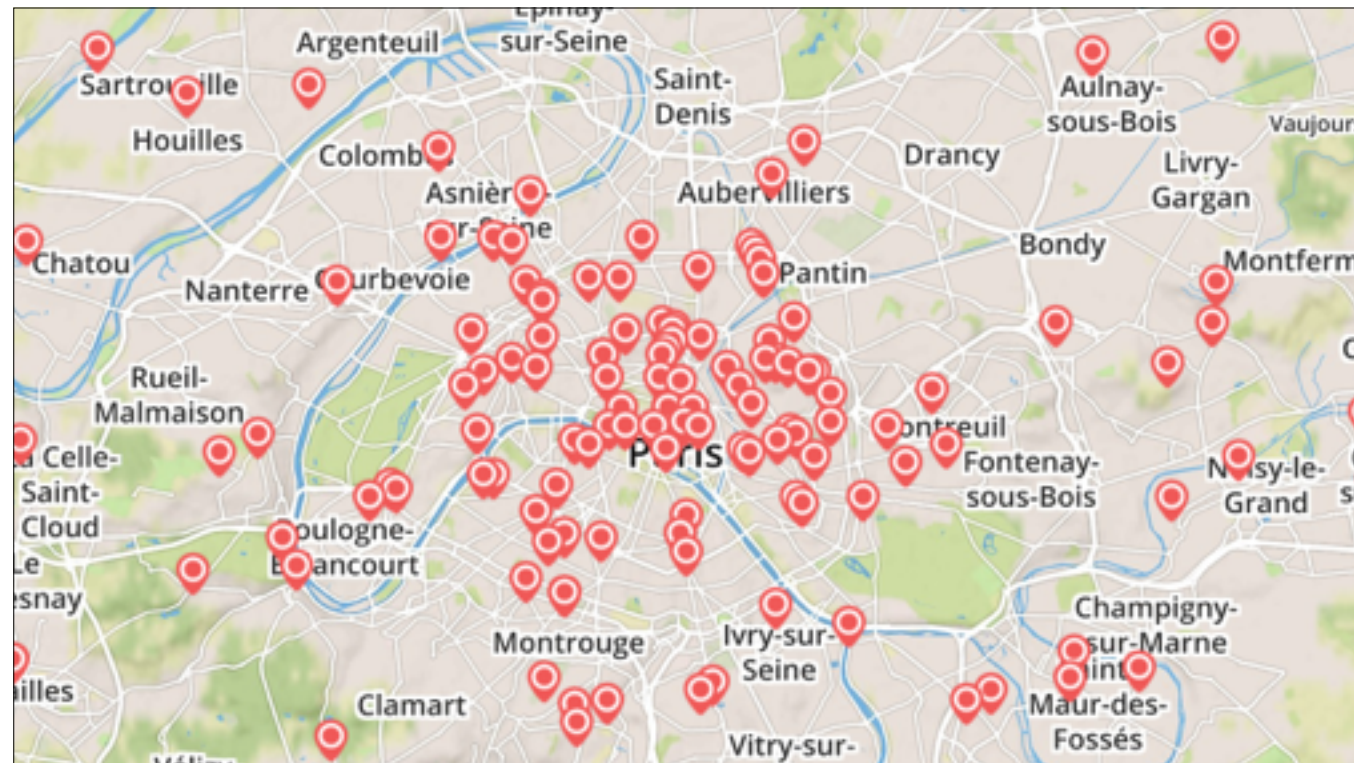


Airbnb for 3D Printing



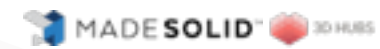


Celebrated all our Hubs with the WeAre20K Campaign



181 Printers in Paris

# DIGITIZING EVERYTHING



- Through our distributed network we're enabling the digitization of physical products
- 3D printers enable digital distribution of physical products.
- It is a long term trend that already exist in different industries like the music industry(next slide)



- Spotify distributes content across different devices. What matter is the content, the information.





Before 3dhubs and Spotify, Amazon digitalised books and they are now available on e reader. It creates a new way to consume content.

So in the same way as Kindle has done for digitizing books and Spotify for music, 3D Hubs does for 3D printing.

For 3dhubs, the goal is to Enable the digital distribution of physical products.

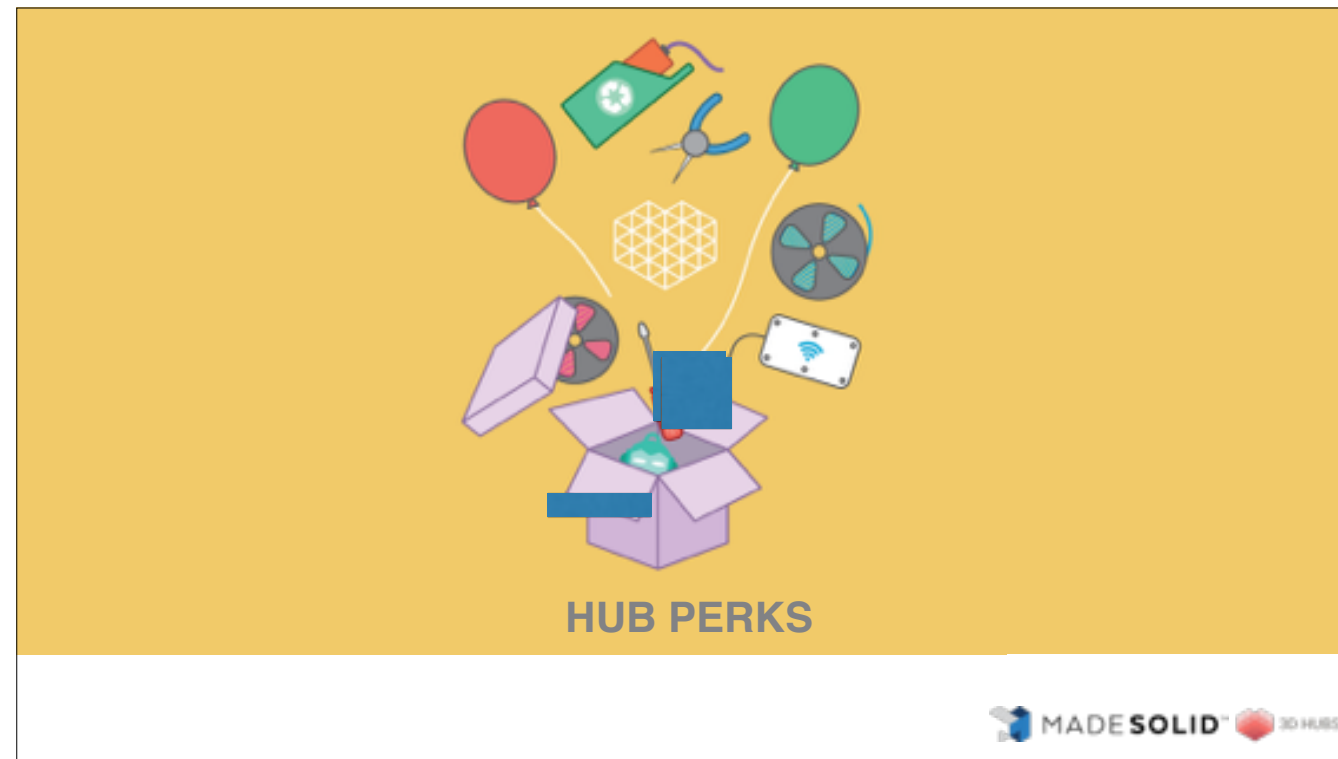
You can print next door a design that was conceive on the other side of the planet. We don't need to import goods that are build overseas. Moreover, you can let print something that was design just for you.



local



on demand



But we don't do this alone. We have now around 22000 Hubs & thousands of customers around the world in over 160 countries and partners

Hub perks: discount on high quality colorfabb filaments, discount on

partnership with youmagine or Cults, a french marketplace for 3d design.

on the production side Fairphone

- Ultimaker who we've partnered with to supply their 'sample prints' to prospective customers.

- As part of this initiative we've partnered with some awesome businesses to offer you some great discounted perks on various products
- We are very excited to partner with MadeSolid



- And now the part you've all been waiting for - The FlexSolid Filament presentation



**Elastic, stretchy, flexy and tough** –FlexSolid is extremely flexible without tearing easily unlike other flexible filaments. It is ideal on anything that requires **engineering tolerance** without compromising on long term **durability**. Compatible with non-Bowden printers.

Note: We do not recommend FlexSolid for intricately detailed prints as stringiness may occur.

## FlexSolid Filament Basics



give samples to audience. ask them to tear the filaments. give pla to compare and abs

# What is FlexSolid?

- Flexible 3D filament
- Strength & Flexibility
- Ideal for wearables, fashion, sports equipment & prosthetics
- FDM/FFF printers



## What is FlexSolid?

- Newly Released in Mid May 2015
- Flexible 3D filament
- Designed for Strength and Flexibility
- Perfect for wearables, fashion, sports equipment sectors, and prosthetics

Compatible with a variety of FDM (fuse deposition modeling/ FFF (fused filament fabrication) printers

## Material Properties

**Hardness:** Shore 98A or 52D

**Density:** 1.15 g/cm<sup>3</sup>

**Tensile Strength:** 50 MPa

**Elongation at break:** 450%



NOTE: for reference, in the next slides we'll explore what these are



# Material Properties

- Stress at 20% elongation: 9 MPa
- Stress at 100% elongation: 15 MPa
- Stress at 300% elongation: 28 Mpa
- Tear strength : 125 N/mm
- Abrasion loss: 25 mm<sup>3</sup>
- Compression set 23C / 72 hrs: 35%
- Compression set 70C / 24 hrs: 50%
- Tensile strength: 35 MPa
- Elongation at break: 450%



For those who are interested these are the material properties of elongation (pulling the printed filament to stretch), Tear strength, Compression set (extent to which you can squash the filament) etc.

So all the properties which make FlexSolid squishy, flexible, stretchable

Ultimate **tensile strength** (UTS), often shortened to tensile strength (TS) or ultimate strength,[1][2] is the maximum stress that a material can withstand while being stretched or pulled before failing or breaking.

## Tried & Tested

Metric	Indicative Of	FlexSolid	NinjaFlex
Izod Impact [ft-lb/in]	Denting resistance	8.42	3
Flexural Stress @ 5% Strain [psi]	Warping ability	243	139
Elongation @ max [%]*	Stretching tolerance	400%	390%
Modulus of elasticity [kpsi]	Ease of deforming	11.2	2.33



We tested FlexSolid against the leading flexible filament on the market.



## What is Izod Impact?

- High Izod impact numbers are strongly correlate to dent resistance or shock absorbency

EG: your iPhone will be protected in this case by minimizing impact upon dropping.



Metric	Indicative Of	FlexSolid	NinjaFlex
Izod Impact [ft-lb/in]	Denting resistance	8.42	3



# Flexural Stress & Elongation?

The ability for a material to elongate & flex is critical in parts subject to constant pull & tears.

- Wearables & jump ropes take advantage of these



Metric	Indicative Of	FlexSolid	NinjaFlex
Flexural Stress @ 5% Strain [psi]	Warping ability	243	139
Elongation @ max [%]*	Stretching tolerance	400%	390%



## What is Flexural Stress

The ability for a material to elongate and flex is critical in parts subject to constant pull and tears. Prints like wearable items and jump ropes take advantage of these properties.

On the left, a flexible buckle is an application that is subject to constant pull from various loads. FlexSolid allows the print to flex and stretch without tearing.

# What is Modulus of Elasticity?

A high modulus of elasticity = ease of deformation & conformation.

- Benefits customized & form fitting prints



Metric	Indicative Of	FlexSolid	NinjaFlex
Modulus of elasticity	Ease of deforming	11.2	2.33



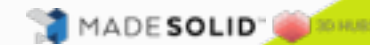
A high modulus of elasticity implies ease of deformation and conformation. Naturally, any print that is customized and form fitting benefits from a high modulus of elasticity.

On the left, a shoe sole and heel can more easily conform to the end user for a better fit.

## OK! Let's Print!

- For print files and more settings, visit [MadeSolid.com](http://MadeSolid.com)

3D Printer	Layer Height (mm)	Speed (mm/s)	Temp (C)	Build Plate Temp (C)
Type A Machines Series 1 2014	.2	50	240	80
Makerbot Replicator 2X	.15	40	230	80
Flashforge Dreamer **	.2	50	240	80
AirWolf	.2	15	225	55

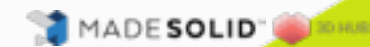


Generally Compatible across all FDM printers  
Here are some printer settings we have been successful with  
For print files and more settings, visit [MadeSolid.com](http://MadeSolid.com)  
tested on ulm2 speed 30mm/s temp 235 c build plate 60 c

## Which printer to use?



[madesolid.com/support/printer](https://madesolid.com/support/printer)



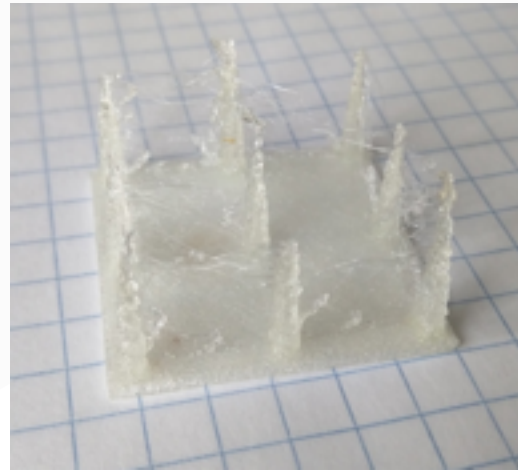
So far we've tested FlexSolid on  
Makerbot Replicator 2  
Type A Series 1 Pro  
UP Plus 2

Who's printing on something else?

If you're up for a challenge we'd love to add more printers to the list and it would be terrific if you'd test the filament on your printers and share your settings, experience and tips on the dedicated MadeSolid Talk Channel

More printer settings will be added at [madesolid.com/support/printer](https://madesolid.com/support/printer)

## Calibration & Troubleshooting

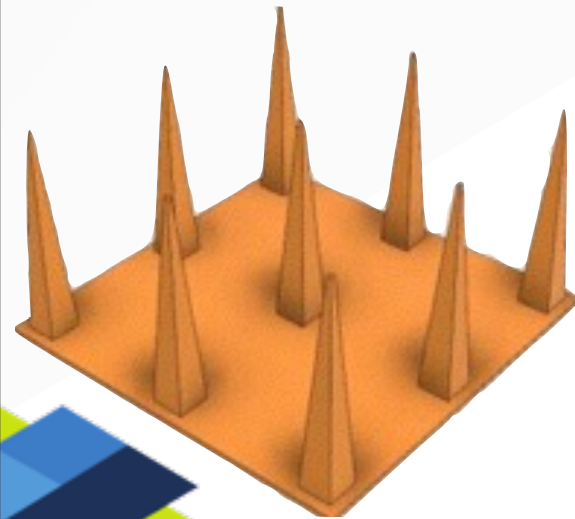




## Something's Not Right...

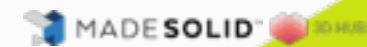
- Most printers need setting adjustments successful prints.
- Temperature Modifications
- Decreasing Print Speeds
- Modifying Flow of Filament

# Calibration Prints for Copolyester Filaments



## Fine Positive Spaces

- Evaluate based on the quality of deposition on spires



calibration object made by make and available on [thingiverse.com](http://www.thingiverse.com/thing:533472) (<http://www.thingiverse.com/thing:533472>) Make: 2015 3D Printer Shoot Out Test Models

# Calibration Prints for Copolyester Filaments



## Overhang Performance

- Allows evaluation of overhangs, wobbling extrusions, and infill hemorrhaging

# Calibration Prints for Copolyester Filaments

## Mechanical Resonance in Z

- Exposes resonance issues if a noticeable loss of registration is seen from the top



# Calibration Prints for Copolyester Filaments

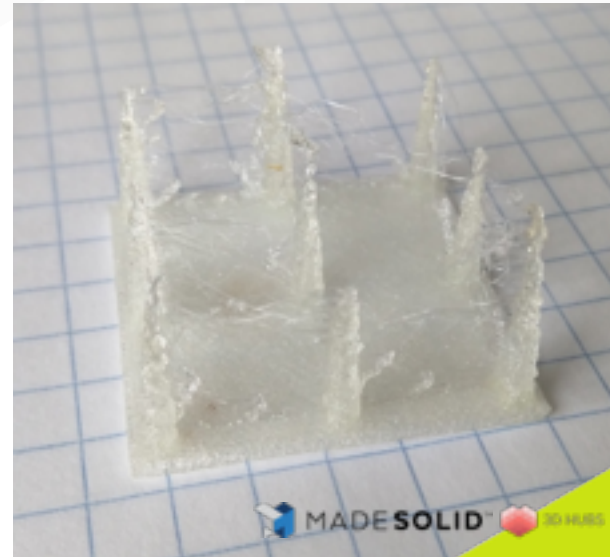


## Mechanical Resonance in Z

- Difference between X and Y measurement indicates backlash in the system

## Temperature Modification

- PET+ settings generally not far off PLA settings
- Usually 10 - 50°C hotter
- Poor layer adhesion?  
Try extruding at a higher temperature

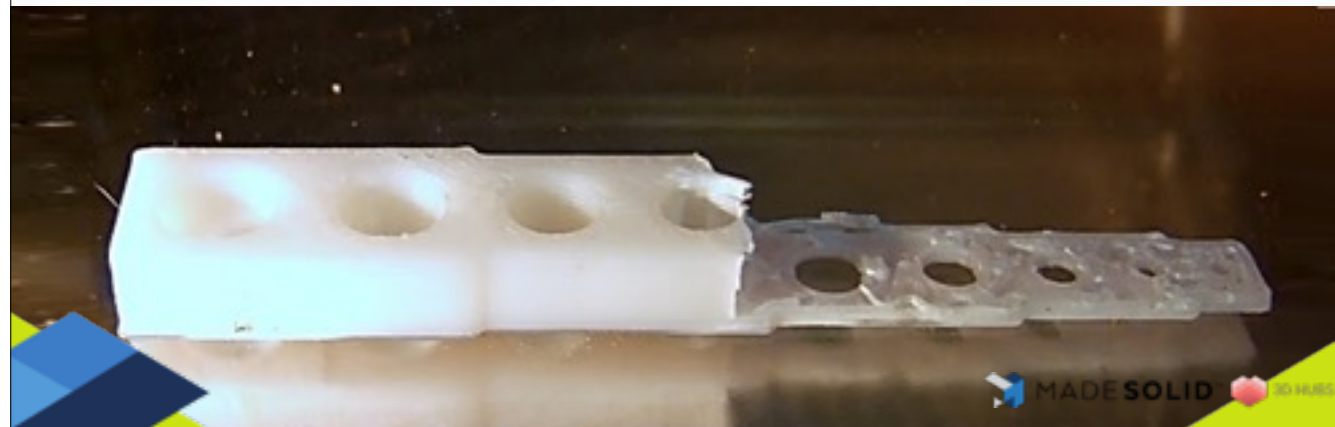


In general, settings for PET (Polyethylene terephthalate)+ are not too far off from PLA (Polylactic acid) settings. Normally, you will extrude at 10-50C hotter (35C on average) to extrude well. One issue that can arise from extruding too low is poor layer adhesion.

At the end, your print should be a single solid piece. Pulling apart layer by layer is a sign that the layers did not adhere well. If this happens, simply bump up the extrusion temperature. Make the final print stronger by staying hot long enough to bond to the next layer

## Decreasing Print Speed

- Slowing down Print Speed (or Feed Rate) to help reduce poor layer adhesion. detail.



Slowing down Print Speed (or Feed Rate) is another method to help reduce poor layer adhesion. It can also help give better detail. Slowing down allows for the nozzle to heat the previous layer more and better adhere the next one. It can also reduce inaccuracies

# Modifying the Flow

Flaky intermittent layers?

increase the flow

Too much leftover material or need to

increase heat settings?

decrease the flow



Known by many names: Extrusion Multiplier. Feedstock multiplier. Packing Density. Sometimes you just need more or less plastic coming out to do the job.

If your layers are our flaky or intermittent increase the flow

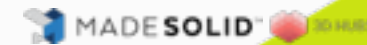
If there is too much leftover material or the heat settings need to be high consider decreasing flow



# Special Requirements & General 3D Printing Tips

## Bowden Filament Jamming

- Flex Filament jams interior of feeder drive
  - 2.85mm FlexSolid that should resolve this issue.
- 
- Delta printer head (Spiderbot) must be modified



In Bowden tube printers, like the Ultimaker, flexible filament will jam in the interior of the feeder driver. Solution would involve making sure the filament can't go to the sides or an attachment that doesn't allow the filament to go anywhere but the extruder.

We have an exact 2.85mm FlexSolid that should resolve this issue.

# Resources



[www.3dhubs.com/talk/madesolid](http://www.3dhubs.com/talk/madesolid)

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**New 250ml Size Bottles of MadeSolid Resin now Available**

Hey Everyone! We now have 250ml size bottles of MadeSolid's popular brands like Vorex in Black, Orange, Gray, White, and Clear. We also have the same size bottles for CastSolid and all of the MS Resin v2 colors of Blue, Black, White, and

MadeSolid

10 hours ago

0 comments

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**Introducing Vorex Clear!**

Want a clear resin that doesn't yellow over time? Check out our new vorex clear in a head-to-head test with Formlabs Clear. [@PMK](#), want to add this to our blend test? Clear-Mix for the win!

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1 comment [@PMK](#)

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**About MadeSolid**

MadeSolid was founded to discover and deliver materials that make it easy for anyone to turn creative ideas into physical form. MadeSolid's advanced materials are easily scaled and integrated into every phase of the product lifecycle, from early prototyping to full-scale production.

My Tags

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MADE SOLID™

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## Where to get more

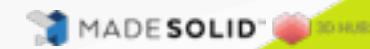


MadeSolid is the producer of a wide range of advanced materials including 3 different types of Resin and two ranges of Filaments.

10%

MATERIAL DISCOUNT

Level	Discount
1 - Rookie (1 order completed)	10%
2 - Starter (5 orders completed)	15%
3 - Intermediate (25 orders completed)	20%
4 - Professional (125 orders completed)	25%



# Enjoy Your FlexSolid Filament!

Do you have questions, comments or would you like to show off you prints, find us at  
[www.3dhubs.com/talk/madesolid](http://www.3dhubs.com/talk/madesolid)

